# Validation of g-value and optical transmission of MicroShade® MS-A

The thermal and optical characteristics of MicroShade® MS-A have been validated by the Fraunhofer Institute for Solar Energy Systems in Freiburg, Germany. The results are presented in the report *TAG3-HRW-1008-E10 Thermal and optical characterization of MicroShade®* and include an extensive investigation of the direct-hemispherical solar energy transmittance, the direct-direct solar energy transmittance and the light transmittance. The key thermal and optical results from the report are shown below.

**g-value**
The validation was performed on a triple-glazed unit with MicroShade® MS-A consisting of (from outside to inside):

*4 mm Pilkington Opticlear + MicroShade® MS-A - 18 mm argon-filled cavity - 4 mm Pilkington Optitherm S3 (position 3) - 18 mm argon-filled cavity - 4 mm Pilkington Optitherm S3 (position 5)*

The table below shows the measured angle dependant g-values (total solar energy transmittance) for the triple-glazed unit with MicroShade® MS-A and the corresponding calculated values using MicroShade MSpec (MicroShade Performance Calculator) simulation program.

| Solar height | g-value measurements Fraunhofer ISE | g-value MSpec MicroShade |
|:---:|:---:|:---:|
| 0˚ | 0.30 ± 0.03 | 0.35 ± 0.02 |
| 45˚ | 0.15 ± 0.03 | 0.18 ± 0.02 |
| 60˚ | 0.08 ± 0.02 | 0.07 ± 0.01 |

The g-values calculated with MicroShade MSpec are all within the measurement range.

**Optical transmission**
The validation was performed for the MicroShade® MS-A strip alone.

The figures below show the measured transmission through the MicroShade® MS-A strip and the transmission calculated with MicroShade MSpec. The figures show the varying transmittance of MicroShade® MS-A with solar height and azimuth angle.
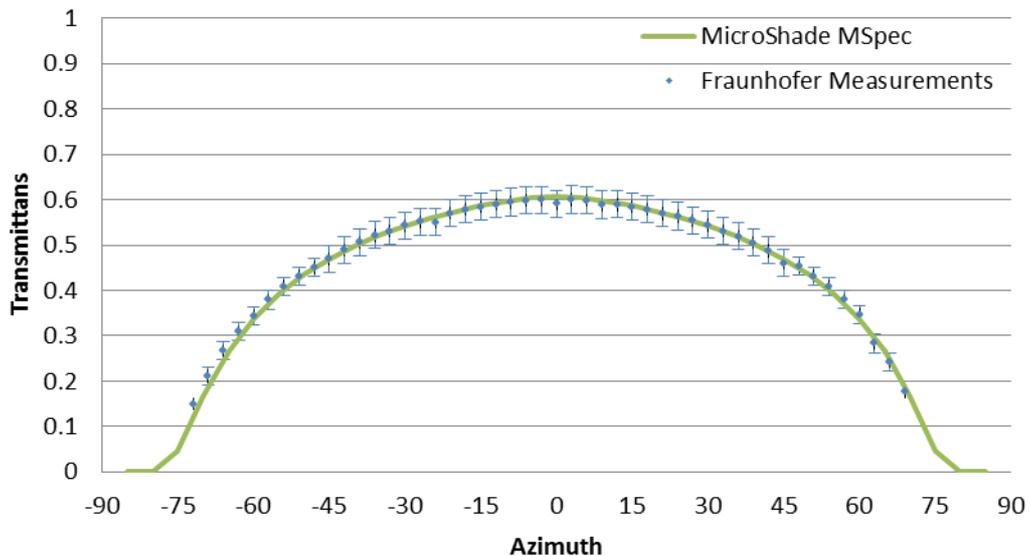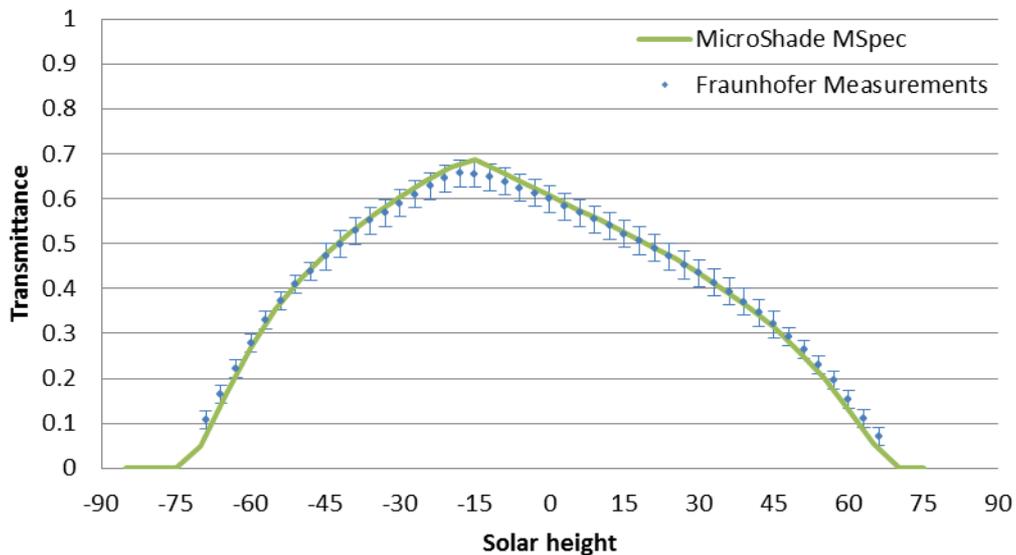
As clearly indicated by the above figures, there is excellent agreement between the measured and calculated values.
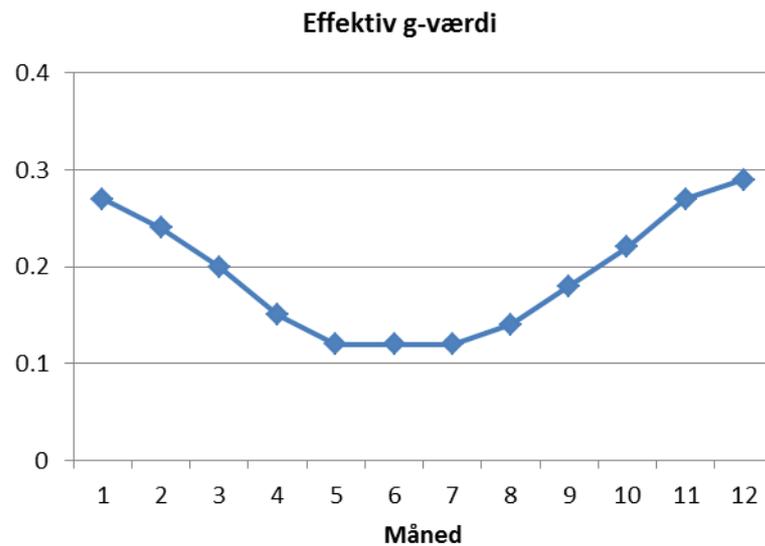
**Effective g-value**

The g-value is normally quoted for the perpendicular solar radiation on the window pane, also called **$g_0$-value**.

MicroShade® is a progressive sun protection product in which the angle of the solar radiation determines the shading effect. Thus the g-value of MicroShade® varies according to the altitude and position of the sun and cannot be described with just a single number ($g_0$-value). Instead, the **effective g-value,** which reflects the actual solar radiation through the window pane, is measured over a specified period of time. The effective g-value depends on the angle

of the solar radiation, i.e. the position of the sun and is calculated on the basis of weather data.

In the table and graph below, the effective monthly g-values for a south facing façade in Würzburg (Germany) are shown as an example. The values are calculated with MSpec and use the verified data above.

| Month | Effective g-value |
|-------|-------------------|
| Jan | 0.27 |
| Feb | 0.24 |
| Mar | 0.2 |
| Apr | 0.15 |
| May | 0.12 |
| Jun | 0.12 |
| Jul | 0.12 |
| Aug | 0.14 |
| Sep | 0.18 |
| Oct | 0.22 |
| Nov | 0.27 |
| Dec | 0.29 |

**Effektiv g-værdi**

A calculation of the effective g-value for a specific façade or roof location and orientation can be made by contacting MicroShade A/S at support@microshade.dk.